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IN THE UNITED STATES PATENTS AND TRADEMARK OFFICE

K-2020

Applicant : Mitsuhiro Nishida et al.
Title : ANTIREFLECTION FILM
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Examiner : Andrew T. Piziali

Hon. Commissioner for Patents
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APPEAL BRIEF

Sir:

Further to the Notice of Appeal filed on May 24, 2004, an appeal brief has been filed in triplicate. A credit card authorization form in the amount of \$330.00 is attached herewith for the appeal brief fee.

REAL PARTY IN INTEREST

The applicant is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There is no related appeal and interference.

STATUS OF CLAIMS

Claims 1 and 14-17 were rejected finally, and are at issue.

STATUS OF AMENDMENT

In response to the final Action of February 17, 2004, an amendment was filed on May 24, 2004. The amendment was entered by the advisory Action of June 3, 2004.

SUMMARY OF INVENTION

The invention relates to an antireflection film to be mounted on a plasma display panel, a liquid crystal display panel, and so on.

A conventional antireflection film is formed of an organic film, a high refractive index layer, and a low refractive index layer, which are laminated together. In order to provide antistatic property, particles of electrically conductive metal oxide have been added to the high refractive index layer. However, since the particles of the electrically conductive metal oxide are not so high in refractive index, refractive index in the high refractive index layer can not be made so high, so that a specific lower reflective index layer has been used (paragraphs 0003-0005 of the specification).

In view of the problems, the present invention has been made. In the invention, the high refractive index film with antistatic property has sufficiently high refractive index, so that the low refractive index layer can be made of an inexpensive material, suitable for the antireflection film.

An antireflection film of the invention comprises an organic film (1), a hard-coating layer (2) laminated on the organic film, a high refractive index layer (3) laminated on the hard-coating layer, and a low refractive index layer (4) laminated on the high refractive index layer (paragraph 0008). The antireflection film has a surface resistance of $5 \times 10^{12} \Omega/\square$ or less (paragraph 0028).

The high refractive index layer has a refractive index in a range of 1.65 to 1.85 (paragraph 0026), and is formed of metal oxide particles of ITO with electrical conductivity and TiO_2 with

high refractive index, and at least one synthetic resin selected from the group consisting of styrene resin, epoxy resin and acrylic resin (paragraph 0019).

As stated in paragraph 0017, the high refractive index layer (3) containing the metal oxide particles of ITO with electrical conductivity and TiO_2 with high refractive index provides high refractive index and excellent antistatic property.

In the antireflection film of the invention, a volume percentage of the TiO_2 particles to a total volume of the TiO_2 and ITO particles in the high refractive index layer is 1 to 60%. Accordingly, the high refractive index layer (3) can provide high refractive index and excellent antistatic property, as stated in paragraph 0018.

In the antireflection film of the invention, a volume percentage of the metal oxide particles to a total volume of the metal oxide particles and the synthetic resin is 20% or more.

The low refractive index layer has a refractive index in a range of 1.35 to 1.55 (paragraph 0026). The low refractive index layer is formed of acrylic resin with fluorine or silicone resin (paragraph 0024), and further includes particles of fluorine resin in an amount of 10 to 40% by weight to improve reduction of refractive index of the antireflection film, resistance to scuffing and slipperiness of the antireflection film (paragraph 0025).

In the invention, in case the refractive index of the low refractive index layer is 1.45 or less, the antireflection film can provide a minimum surface reflectance of 0.5% or less.

In sum, in the invention, since the high refractive index layer has sufficiently high refractive index, the low refractive index layer can be made of a resin, which is inexpensive and widely used. Therefore, the antireflection film of the invention can be made economically.

ISSUE

- (1) whether claims 1 and 14-17 are unpatentable under 35 U.S.C. 103(a) over Ota in view of Endo.
- (2) whether claims 1 and 14-17 are unpatentable under 35 U.S.C. 103(a) over Ota in view of Endo and further in view of Oka.
- (3) whether claims 1 and 14-17 are unpatentable under 35 U.S.C. 103(a) over Endo in view of Ota.
- (4) whether claims 1 and 14-17 are unpatentable under 35 U.S.C. 103(a) over Endo in view of Ota and further in view of Oka.

GROUPING OF CLAIMS

In each issue, claim 1 represents the invention.

ARGUMENT

- (1) whether claims 1 and 14-17 are unpatentable under 35 U.S.C. 103(a) over Ota in view of Endo.

In Ota, an antireflection film comprises a substrate 1, a hard coat layer 2, a high refractive index layer 5 and a low refractive index layer 3. An adhesive layer or primer layer 4 may be provided between the substrate 1 and the hard coat layer 5.

The low refractive index layer 3 is an SiO₂ gel film having a refractive index of 1.38 to 1.46 (column 5, lines 10-16). The gel film may include fluorine organosilicon compound, organosilicon compound or boron organic compound to adjust the refractive index (col. 6, lines 14-21).

The high refractive index layer 5 is formed of a binder resin, and fine particles including ZnO, TiO₂, CeO₂, Sb₂O₅, SnO₂, ITO, Y₂O₃, La₂O₃, ZrO₂, and Al₂O₃ (column 8, lines 16-46). The high refractive index layer is in a range of 1.50 to 1.95 (column 8, lines 59-60).

In the invention, the high refractive index layer is formed of the metal oxide particles of ITO and TiO_2 , and synthetic resin. In Ota, it is disclosed that ZnO , TiO_2 , CeO_2 , Sb_2O_5 , SnO_2 , ITO, Y_2O_3 , La_2O_3 , ZrO_2 , and Al_2O_3 can be used. However, combination of the two or more particles is not mentioned as the high refractive index layer 5. Therefore, although ITO and TiO_2 used in the present invention are mentioned, the specific combination of the fine particles used in the high refractive index layer of the invention is not disclosed or suggested.

Especially, as stated in paragraph 0017 of the specification, the high refractive index layer containing the metal oxide particles of ITO with electrical conductivity and TiO_2 with high refractive index provides high refractive index and excellent antistatic property. The specific combination of the two different metal oxide particles and the advantages thereof are not suggested in Ota.

Also, in the invention, a volume percentage of the TiO_2 particles to the total volume of the TiO_2 and ITO particles in the high refractive index layer is 1 to 60%, and a volume percentage of the metal oxide particles to a total volume of the metal oxide particles and the synthetic resin is 20% or more. The specific volume percentages and the combination of the materials used in the invention are not disclosed or suggested in Ota.

In the invention, the low refractive index layer is formed of acrylic resin with fluorine or silicone resin, and further includes particles of fluorine resin in an amount of 10 to 40% by weight. In Ota, the low-refractive-index layer is the SiO_2 gel layer with other additives, different from the invention.

In Ota, the antireflection film includes the hard-coating layer and high and low refractive index layers, but Ota does not disclose or suggest the specific structure of the invention.

Endo is directed to an ultra fine particle film effective for prevention of electrostatic charge and reflection of light. As shown in Fig. 7 and explained in column 14, lines 43-60, an ultra fine particle film includes a substrate 71, a layer 72 with high refractive index particles, and a layer 73 with low refractive index particles. As the fine particles having a high refractive index, SnO_2 , In_2O_3 , TiO_2 and ZrO_2 , and the mixture thereof may be used. As the fine particles having a low refractive index, SiO_2 and MgF_2 may be used. The layer 72 containing the particles of SnO_2 , In_2O_3 , TiO_2 , ZrO_2 , and mixture thereof is provided on the substrate 71 together with a binder, and the particles of SiO_2 or MgF_2 for the layer 73 are simply deposited on the layer 72. The diameter of the particles of SiO_2 or MgF_2 is larger than that of the particles of SnO_2 , In_2O_3 , TiO_2 and ZrO_2 .

In the invention, the high refractive index layer is formed of the metal oxide particles of ITO and TiO_2 , and synthetic resin, and the volume percentage of the TiO_2 particles to the total volume of the TiO_2 and ITO particles in the high refractive index layer is 1 to 60%. In Endo, TiO_2 is used in the layer 72, but the combination of ITO and TiO_2 used in the present invention is not disclosed or suggested.

In the invention, the low refractive index layer is formed of acrylic resin with fluorine or silicone resin, and further includes particles of fluorine resin in an amount of 10 to 40% by weight. In Endo, the layer 73 may contain SiO_2 , as shown in Tables 1 and 2, but the low refractive index layer of the invention, i.e. acrylic resin with fluorine or silicone resin and further including particles of fluorine resin, is not disclosed or suggested in Endo.

Therefore, Endo does not disclose or even suggest the high and low refractive index layers of the invention.

In the final Action, it is admitted on page 3, lines 2-4 that Ota fails to specifically mention the use of two different particles disposed in a resin for the high refractive index layer. In this respect, it is held on page 3, lines 9-11 that Endo discloses that as the ultrafine particles having a high refractive index and a light transmitting and electrically conductive function, SnO_2 , In_2O_3 , TiO_2 , ZrO_2 , and mixture thereof can be used.

What the Examiner said in this respect in the final Action is true. However, Endo only discloses that SnO_2 , In_2O_3 , TiO_2 , ZrO_2 , and mixture thereof can be used as the high refractive index layer. Namely, the combination of ITO in addition to SnO_2 , In_2O_3 , TiO_2 , ZrO_2 is not disclosed or suggested. In paragraph 0017 of the specification, it is held that the high refractive index layer containing the metal oxide particles of ITO with electrical conductivity and TiO_2 with high refractive index provides high refractive index and excellent antistatic property. Also, in the invention, the volume percentage of the TiO_2 particles to the total volume of the TiO_2 and ITO particles in the high refractive index layer is 1 to 60%. The specific combination and the volume percentage of the TiO_2 and ITO particles provide excellent results, and are not obvious from Ota and Endo cited in the final Action.

In the final Action from page 3 to page 4, it was held that Endo does not mention the specific volume percentage of the particles of TiO_2 and the particles of ITO, but it would have been obvious to adjust the volume percentage. As stated in the above paragraph, the Examiner admitted that Endo only discloses that SnO_2 , In_2O_3 , TiO_2 , ZrO_2 , and mixture thereof can be used as the high refractive index layer. Since the mixture of the particles of TiO_2 and the particles of ITO is not disclosed in Endo, it is not understood why the volume percentage of the particles of TiO_2 and the particles of ITO are obvious.

In regard to the third paragraph on page 4 of the final Action, it was requested to prove that prior art products do not necessarily or inherently possess characteristics of claimed products. As explained before, the high refractive index layer containing the metal oxide particles of ITO with electrical conductivity and TiO_2 with high refractive index are not disclosed in Ota and Endo, which are admitted by the Examiner. Since the important features of the high refractive index layer are not disclosed in Ota and Endo in addition to other differences, it is clear that the prior art products do not possess characteristics of the invention.

In regard to the opinion from page 4, line 3 from the bottom to page 5, line 13 of the final Action, Ota and Endo do not disclose that the low refractive index layer is formed of acrylic resin with fluorine or silicone resin, and further includes particles of fluorine resin in an amount of 10 to 40% by weight. The particles of fluorine resin of the invention are different from particles of silica or magnesium fluoride disclosed in Endo.

In regard to the last paragraph on page 5 of the final Action, Ota and Endo do not disclose the specific surface resistance. Since no specific surface resistance is disclosed in Ota and Endo, the surface resistance in the invention is not obvious from Ota and Endo.

Claim 1 of the invention is not obvious from Ota in view of Endo.

- (2) whether claims 1 and 14-17 are unpatentable under 35 U.S.C. 103(a) over Ota in view of Endo and further in view of Oka.

In Oka, an antiglare layer 12 having a fine uneven surface is formed on a transparent substrate, and a layer 13 having a low refractive index is formed on the layer 12. The antiglare layer

includes a matte material, such as plastic beads, and a binder resin. As a binder resin of the antiglare layer or high refractive index layer 12, an ionizing radiation curing resin, such as acrylic resin, can be used (column 10, lines 1-31). In Example B3, an antireflection film, i.e. low refractive index layer, is formed by coating an ionizing radiation curing resin containing 10% by weight of ultrafine particles of magnesium fluoride. Namely, magnesium fluoride particles are added to an acrylic resin, epoxy resin and so on.

Acrylic resin can be used in the low refractive index layer in Oka, but ITO and TiO_2 particles used in the high refractive index layer of the invention are not disclosed or suggested in Oka. The particles of magnesium fluoride are different from the particles of the fluorine resin used in the low refractive index layer of the invention. Thus, the low refractive index layer of the invention is not disclosed or suggested in Oka.

As explained in section (1), Ota and Endo do not disclose or suggest the antireflection film of the invention. Even if Oka is further combined, claim 1 of the invention is not obvious from the cited references.

(3) whether claims 1 and 14-17 are unpatentable under 35 U.S.C. 103(a) over Endo in view of Ota.

As explained in section (1), Endo and Ota do not disclose or suggest the features of claim 1 of the invention.

In regard to the opinion on page 8, lines 3-7 of the final Action, it was held that Endo does not mention the specific volume percentage of the particles of TiO_2 to the total volume of the particles of TiO_2 and the particles of ITO. This explanation is true. However, Endo only discloses SnO_2 , In_2O_3 , TiO_2 , ZrO_2 , and mixture thereof as the particles in the high refractive index layer. Namely, Endo does not disclose the combination of TiO_2 and

ITO particles. Further, since the combination of the TiO_2 and ITO particles is not disclosed in Endo, it is not obvious to adjust the volume percentages of TiO_2 and ITO particles (page 8, lines 3-7).

In regard to the Examiner's opinion from page 8, line 8 to page 9, line 4 of the final Action, the ultrafine particles used in Endo may be coated with a coating solution. However, no volume percentage of the particles is disclosed therein. Although Ota discloses that the binder with the particles can be selected to have the specific refractive index, no volume percentage of the particles is disclosed. The selection of the volume percentage of the particles in the resin is different from the adjustment of the particles of the refraction index in the coating solution.

In regard to the Examiner's opinion on page 9, lines 5-8 of the final Action, Endo and Ota do not disclose the surface resistance of the invention.

In regard to the Examiner's opinion on page 9, lines 9-16 of the final Action, as explained before, Endo does NOT disclose the combination of TiO_2 particles with ITO particles. Also, Endo does not disclose the specific refractive indices of the high and low refractive index layers. The combination having the specific refractive indices of the high and low refractive index layers is not obvious from Endo.

As explained above, claim 1 is not obvious over Endo in view of Ota.

- (4) whether claims 1 and 14-17 are unpatentable under 35 U.S.C. 103(a) over Endo in view of Ota and further in view of Oka.

As explained in section (2), the acrylic resin can be used in the low refractive index layer in Oka, but ITO and TiO_2 particles used in the high refractive index layer of the invention are not disclosed or suggested in Oka. The particles of magnesium fluoride

are different from the particles of the fluorine resin used in the low refractive index layer of the invention. Thus, the low refractive index layer of the invention is not disclosed or suggested in Oka.

As explained before, Ota and Endo do not disclose or suggest the antireflection film of the invention. Especially, the combination of ITO and TiO_2 particles is not obvious from Ota and Endo. Therefore, even if Oka is further combined, claim 1 of the invention is not obvious from the cited references.

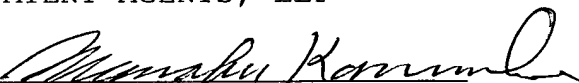
CONCLUSION

As explained above, the cited references do not disclose or suggest the features of claim 1 of the invention. Even if the cited references are combined, the present invention is not obvious from the cited references.

It is respectfully requested that the rejections be reversed, and the application be allowed.

Respectfully Submitted,

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CLAIMS

1. An antireflection film comprising:

an organic film,

a hard-coating layer laminated on the organic film,

a high refractive index layer laminated on the hard-coating layer and having a refractive index in a range of 1.65 to 1.85, said high refractive index layer being formed of metal oxide particles of ITO with electrical conductivity and TiO_2 with high refractive index, a volume percentage of the TiO_2 particles to a total volume of the TiO_2 and ITO particles in the high refractive index layer being 1 to 60%, and at least one synthetic resin selected from the group consisting of styrene resin, epoxy resin and acrylic resin, a volume percentage of the metal oxide particles to a total volume of the metal oxide particles and the at least one synthetic resin being 20% or more, and

a low refractive index layer laminated on the high refractive index layer and having a refractive index in a range of 1.35 to 1.55, said low refractive index layer being formed of acrylic resin with fluorine or silicone resin and further including particles of fluorine resin in an amount of 10 to 40% therein by weight to improve reduction of refractive index of the antireflection film, resistance to scuffing and slipperiness of the antireflection film, wherein said antireflection film has a surface resistance of $5 \times 10^{12} \Omega/\square$ or less.

14. An antireflection film as claimed in claim 1, wherein said hard coating layer includes electrically conductive metal oxide particles to have antistatic properties.

15. An antireflection film as claimed in claim 14, wherein said volume percentage of the metal oxide particles to the total volume of the metal oxide particles and the synthetic resin is 40 to 60%.

16. An antireflection film as claimed in claim 14, wherein said high refractive index layer has a thickness between 75 and 90 nm, and said low refractive index layer has a thickness between 85 and 110 nm.

17. An antireflection film as claimed in claim 16, wherein said refractive index of the low refractive index layer is 1.45 or less to provide a minimum surface reflectance of 0.5% or less for the antireflection film.